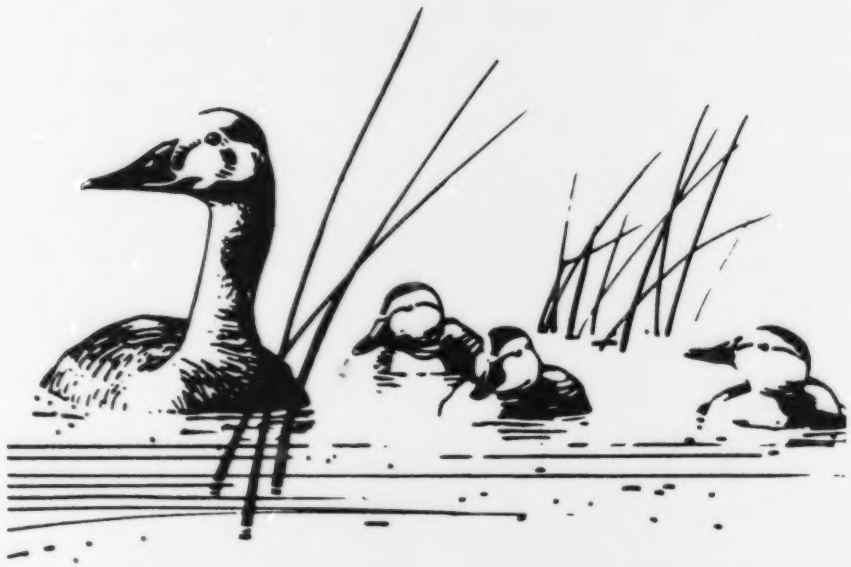
NORTH
AMERICAN
WATERFOWL
MANAGEMENT
PLAN

MANITOBA IMPLEMENTATION PLAN

1988 - 2000



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Manitoba Agriculture

Manitoba Natural Resources

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MANITOBA IMPLEMENTATION PLAN

North American Waterfowl Management Plan

Prairie Habitat Joint Venture

Manitoba NAWMP Technical Committee

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July 1988

SUMMARY

1. The NAWMP objectives for Manitoba are to: 1) produce and maintain an average May breeding mallard population of 400,000 (equivalent to 186,000 pairs), 2) produce and maintain an average breeding population of 2.0M total ducks, and 3) promote waterfowl-compatible farming techniques that also contribute to soil and water conservation.

2. Under the auspices of the Prairie Habitat Joint Venture Steering Committee, the Manitoba NAWMP Technical Committee developed an implementation plan that targeted direct and indirect programs for southwestern Manitoba (prairie pothole habitat). This plan would produce large contiguous blocks of dense cover which would remain undisturbed during the waterfowl nesting season (April - August).

3. A computer planning tool (CPT) was developed to: 1) generate biologically sound waterfowl population estimates, and 2) define cost-effectiveness of the various proposed programs. Evaluation and public relations are considered a necessary component of the plan.

4. Proposed direct programs include: 1) establishing blocks of fenced and unfenced nesting cover, 2) demonstrations of rotational grazing, chemical fallow, stubble mulch fallow, winter wheat, 3) incentive payments to establish hay cover on marginal and/or erodible cropland, and to delay hay cuts on existing hayland, and 4) nest baskets.

5. The indirect program includes recommendations to modify existing land use policies such as: 1) the crop quota system, 2) municipal property taxes, 3) herbicide costs, and 4) water management.

6. The program would be implemented on a land base of just over three million acres, of which 89% is "improved." Of the improved land, 1% (27,000 acres) are to be converted to intensively managed wildlife cover (purchase, lease), 4% (101,000 acres) would be hayed late or converted to forages, and 14% (371,000 acres) would be affected by techniques that leave stubble on the land, improve soil and water conservation, or improve pasture quality. Additionally, 3900 nest structures would be placed on the landscape.

7. Of the total upland acreage (499,000 acres) on which cover would be improved, agricultural extension (demonstrations) would account for changes on 74% of the area. Incentive payments (delayed hay cuts and seeding of marginal cropland) would secure 21% of acreage goals. Five percent of the total acreage would be affected by either purchase (3%), lease (1%), or free easements (crown pastures) (1%).

8. Changes in habitat as a result of this plan are expected to produce 63,200 additional spring-breeding mallards and 57,000 additional mallard recruits. An estimated 250,000 additional pairs of breeding upland nesting waterfowl and 222,000 additional recruits of upland nesting waterfowl species would be produced.

9. Results of our simulations assume no significant upland or wetland habitat change in unmanaged areas over the 15-year program. Waterfowl production objectives only can be met if the current upland and wetland habitat base is maintained through indirect programs.

10. This program of habitat improvements, evaluation, and administration is estimated to cost $82.9M over 15 years. Of this subtotal, 80% is required for direct programs, 16% for administration, and 4% for evaluation. The indirect, public relations and crop damage prevention programs were assumed to cost an additional $11.2M over the 15 years.

11. The 15-year plan would require 482 staff-years. One hundred ninety staff-years would be required for habitat development and habitat management, 210 staff-years for administration, and 82 staff-years for evaluation. No staff-years were assigned to the indirect, public relations and crop damage prevention programs.

12. The administrative headquarters would be located in southwestern Manitoba with up to five district offices. Each district office would service 30 target townships.

13. Ongoing evaluations of the proposed habitat programs would provide critical feedback to the PHJV on progress toward population objectives. Those programs requiring the greatest resources and projected to produce the most ducks will be evaluated first. Evaluation will begin prior to, or concurrent with, implementation. Generally, important assumptions made during the planning process about nesting use and success of these covers will be tested.

14. Implementation and evaluation of the proposed plan would require equipment (spraying, seeding), supplies (introduced and native grass seed), and trained manpower far in excess of what now exists among the various wildlife agencies. Trained people and seed supplies are considered the two most critical shortages.

15. Native and introduced grass seed requirements are considerable. Developing Manitoba sources should be a high priority and a forage seed production program should be planned and initiated immediately.

16. A coordinated program of public information and education is required prior to and during implementation of Manitoba's Plan. This Public Relations Program is an absolute necessity to muster the public's and landowners' support for the Manitoba Plan.

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1.1 Overview

Manitoba's breeding duck populations have been declining since 1955. In 1984, southern Manitoba mallard and total duck breeding populations reached historical low levels of 176,000 and 823,000, respectively. This long-term prairie-wide decline in ducks, led to an international initiative to identify and address the factors responsible. Consequently, the North American Waterfowl Management Plan (NAWMP) was drafted and signed by the Governments of the United States and Canada in 1986 (Anon. 1986). An "ad hoc" Prairie Habitat Joint Venture Steering Committee (PHJV) was established to facilitate agreements negotiated and agreed to by all those participating in the implementation of the NAWMP. Initially, this group developed a prospectus identifying general strategies and guidelines to return prairie waterfowl populations to 1970-1979 average levels (The Canadian Prairie Habitat Joint Venture 1987).

Under the auspices of the PHJV, the provincial and federal governments along with several non-government wildlife organizations have cooperatively developed this implementation plan to protect and improve waterfowl breeding habitat within Manitoba. The plan identifies specific provincial Mallard population objectives, geographical priority areas, habitat management and evaluation strategies, and the resources required over the next 15 years.

1.2 Objectives

The primary objectives for southern Manitoba are the following:

1. To produce and maintain an average breeding mallard population of 400,000 (equivalent to 186,000 pairs) and to provide an average annual fall flight of 760,000 mallards.

2. to produce and maintain an average breeding population of 2.0M total ducks,

3. to accomplish these population objectives by affecting land use on 499,000 acres of land through various incentives and

4. to integrate a waterfowl production enhancement strategy with an agricultural soil and water conservation strategy.

The breeding population objective represents an increase from a predicted base mallard population of approximately 300,000 breeding birds; 255,000 recruits, and 575,000 mallards in the fall flight. To accomplish this objective, the PHJV Prospectus targeted hen success at 43% and a juvenile: adult fall age ratio of 1.11:1 (1970-79 average). By meeting this mallard objective, it would result in 400,000 recruits and a fall flight of 760,000 mallards. In

achieving this mallard objective, an average breeding population of 2.0M total ducks also will be produced and maintained.

1.3 Focus

Eighty percent of waterfowl are produced on private land in southwestern Manitoba. Although wetland drainage and degradation is ongoing in this region, the lack of suitable nesting cover is considered most immediately limiting to waterfowl. The NAWMP has identified low nest success in the prairie pothole region as a major reason for declining duck populations. Currently, production of upland nesting waterfowl (mallard, northern pintail, gadwall, American wigeon, northern shoveler, blue and green-winged teal, and lesser scaup) is low in this region because nesting cover has been reduced to remnant patches which are easily searched by predators. In order to accomplish the objectives of the Implementation Plan the focus is on the following:

1. programs to produce large blocks of dense nesting cover (DNC) that will remain undisturbed between April and August,

2. programs that encourage waterfowl compatible farming techniques that also contribute to soil and water conservation,

3. maintaining the current wetland base, and

4. increasing hen success.

However, maintaining the present quality of this habitat is essential. The programs outlined in this plan will lead to improved recruitment by upland nesting ducks as long as the present wetland base is maintained with appropriate policies, and harvest is regulated as outlined in the NAWMP.

1.4 Approach

A variety of programs will be necessary to produce the shifts in land use required to meet and sustain Manitoba's NAWMP waterfowl population objectives. Direct habitat management programs, implemented in high waterfowl capability areas, will be aimed at achieving a rapid waterfowl response. Other programs will focus on soil and water conservation farming techniques, changing public opinion and policies. These are intended to produce broad-scale land use shifts that will benefit waterfowl in the long term.

A computer planning tool (CPT) was developed to:

1) generate biologically sound waterfowl population projections, and

2) define cost-effectiveness of the various programs proposed.

Evaluation will be an integral component of the plan. An evaluation approach has been developed for the PHJV; part of which is incorporated in this report.

1.5 Philosophy for Program Selection

The number of acres that could be developed annually under each type of habitat treatment over the 15-year term of the NAWMP was estimated. Relative-efficiency outputs from an economic model permitted selection and prioritization of habitat treatments. On the basis of experience, the maximum acreage achieveable for each treatment was estimated.

2.0 METHODS

2.1 Selection of Program Target Areas

In Manitoba, pothole habitat lies largely in the parkland biome and encompasses Canadian Wildlife Service Waterfowl Survey Strata Areas 39 and 40, as well as small adjacent sections of Strata 37 and 38 (Figure 1). According to annual breeding waterfowl counts, these areas account for an average (1970-79) of ±55% of the breeding mallards in southern Manitoba.

Townships were prioritized on the basis of their present habitat quality and potential for supporting waterfowl. Data sources included the 1981 Provincial Forest Inventory, Canada Land Inventory for Waterfowl, and 1986 LANDSAT analysis of wetlands for Stratum 40 from Ducks Unlimited. Present land use data for the target townships was acquired from the digitized 1981 Manitoba Forest Inventory. Townships in the target strata were ranked according to total acreage of temporary (wet meadow and shallow marsh), permanent (deep marsh and open water) wetland habitat, and intensity of agriculture. After excluding areas in parks and reserves, townships were selected sequentially until 75% of the total wetland area was included. On the basis of field experience, this sample was refined by deleting or adding several townships. In total, 146 townships (5256 mi^2) were selected for habitat initiatives, of which 130 were in Strata 39 and 40 (Figure 2).

2.2 Computer Planning Tool

A computerized process was developed to efficiently plan the habitat implementation program. Ducks Unlimited Canada developed an Economic Model that was integrated with an existing United States Fish and Wildlife Service (USFWS) Mallard Production Model. A manual (Conchatre et al. 1987) describing the background and workings of this Computer Planning Tool (CPT) is available. All provinces in the PHJV are using the CPT to develop their respective implementation plans.

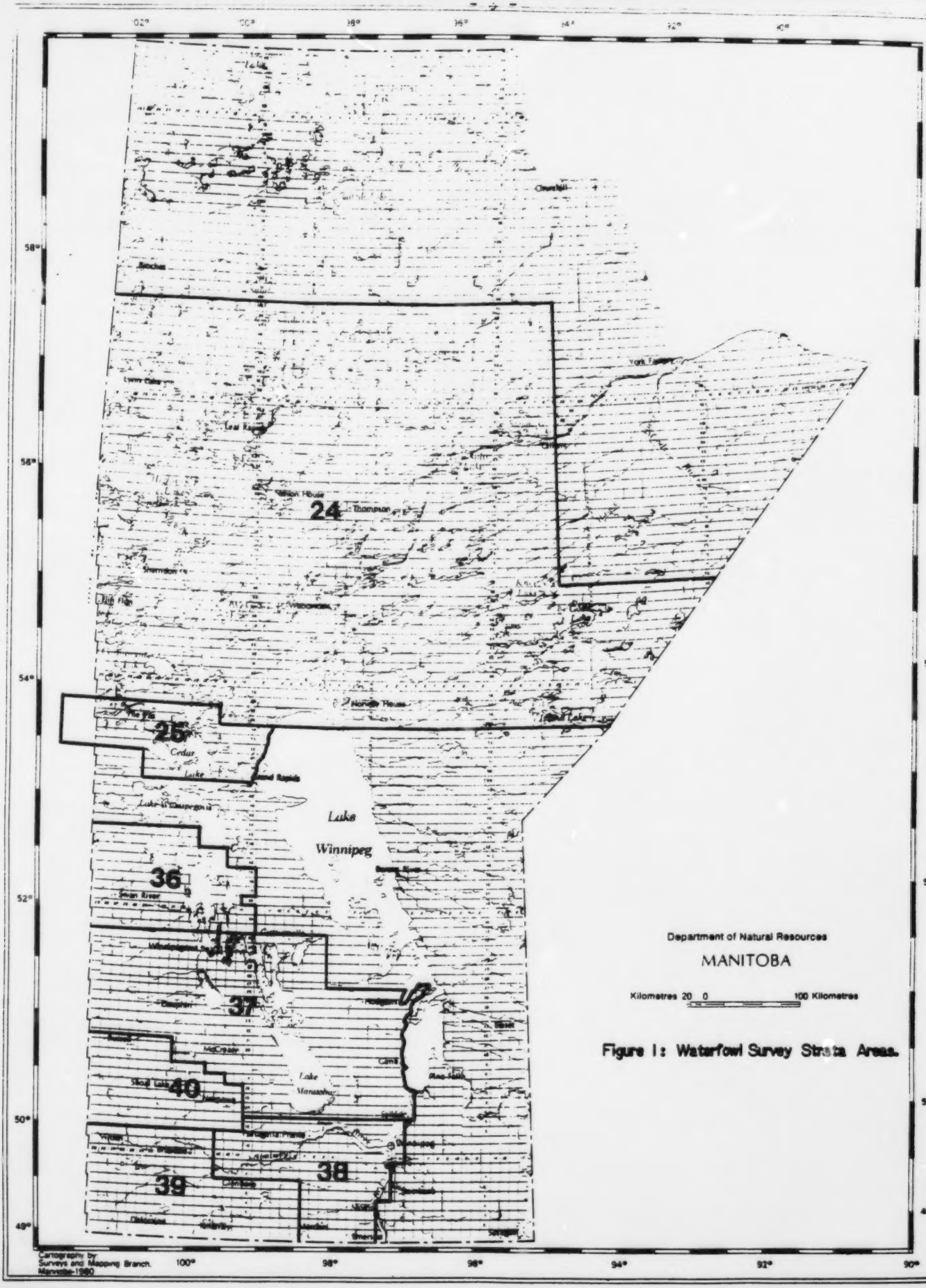

Figure 1: Waterfowl Survey Strata Areas.

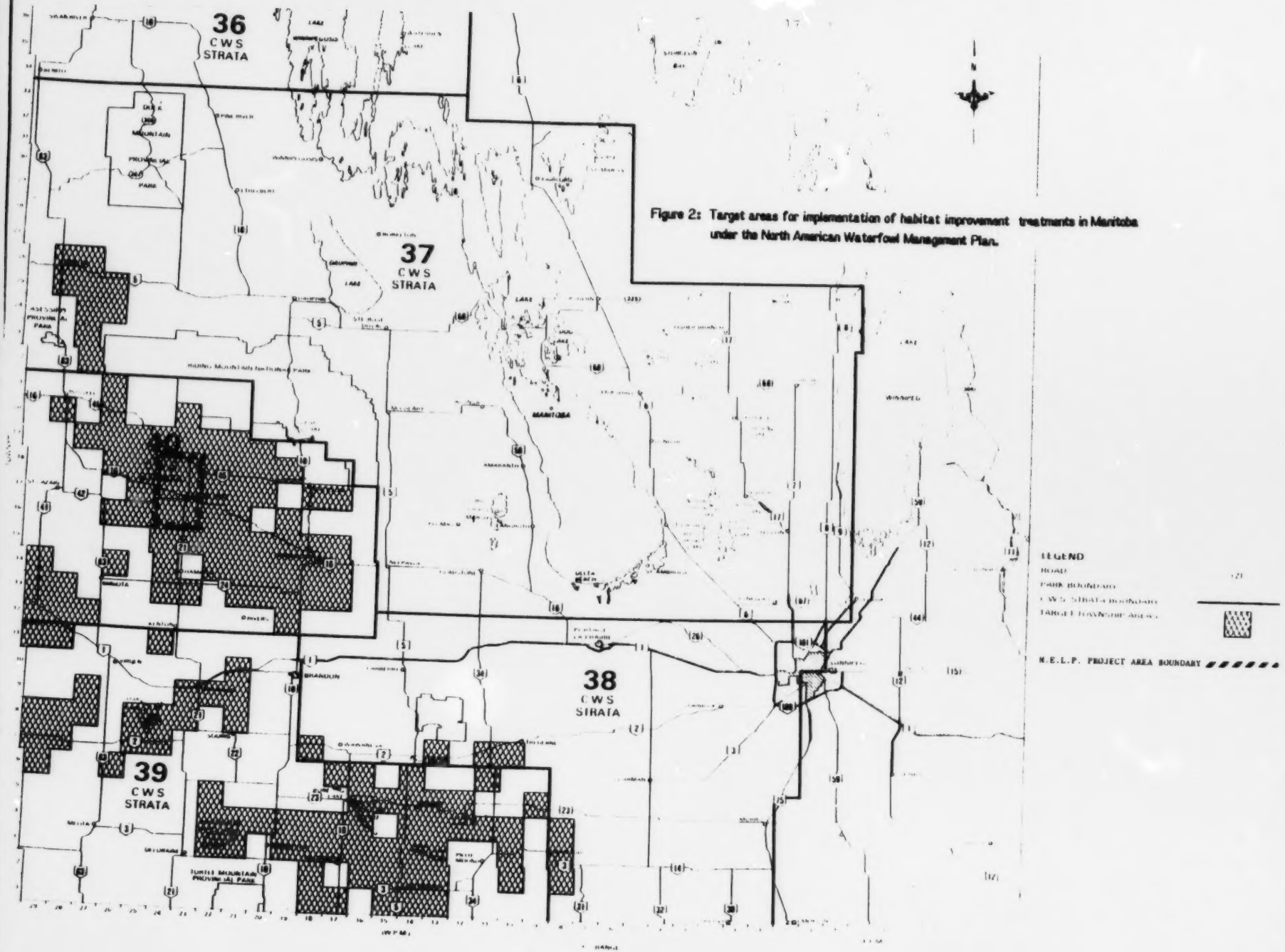

Figure 2: Target areas for implementation of habitat improvement treatments in Manitoba under the North American Waterfowl Management Plan.

2.2.1 Economic Model

The Economic Model within the CPT enables users to determine relative efficiencies of, and resource needs for, potential habitat improvement techniques. The following information from published and unpublished sources was used in the model:

1. staff costs/time,
2. land costs,
3. equipment and supply costs, and
4. estimates of duck recruitment gained from establishing various forms of treated cover.

Inflation was projected at 4% annually.

In the model, developed acres were maximized for the most cost-effective treatments first and then lower ranking treatments were added in order until population objectives were achieved. Economic outputs include the following:

1) manpower needs and costs by quarter year for development and management,
2) total costs for development and management,
3) summaries of acres proposed for each treatment, and
4) summaries of all data sources and assumptions made.

Annual outputs for the final implementation program were produced for the 15-year term of the NAWMP. Baseline land use information and projected annual changes in the landscape resulting from habitat programs, were input to the Mallard Production Model.

2.2.2 Mallard Production Model

The Mallard Production Model (known also as the Cowardin Model) was developed to estimate mallard recruitment from a block of landscape on the basis of a breeding population of 1000 pairs (600 adult females, 400 juvenile females). The model was used to estimate if hypothetical habitat programs could efficiently achieve Manitoba's waterfowl population objectives.

The model takes into account many aspects of mallard breeding biology. Laying chronology, clutch size, nest success, renesting effort, and female survival, were considered in relation to wetland conditions and nesting cover characteristics (e.g., relative attractiveness to laying hens over time, security from predators, and man-induced alterations). Where they existed, data from Manitoba and prairie Canada were input for these variables, otherwise, information from North Dakota studies was used. Main assumptions of the model are listed in Appendix 1.

Evaluations in Manitoba will be centered on testing these and other critical assumptions.

It was assumed that most of the habitat improvement programs would be implemented over the first ten years. To simulate annual mallard recruitment arising from the habitat improvement program, the Mallard Production Model was run sequentially through to 1996. Ten-year model simulations incorporated baseline population data from 1986, and expected annual changes in survival rates, wetland conditions, pair populations, and carrying capacities.

The objective of the plan is to meet target population levels following implementation in years of "average" wetland conditions. Therefore, in the simulation, wetland conditions for the last five years (1997-2001) were assumed to be "average." Population projections for the last five years then were used to measure the success of the program.

3.0 DIRECT WILDLIFE PROGRAMS

This section describes direct habitat programs selected with the aid of the CPT. Only important assumptions and criteria for each habitat program are included. More specific information can be found in the CPT manual (Conchatre et al. 1987).

Programs can be conceptually divided into those designed specifically for waterfowl production and those designed that also would include agricultural benefits. The land use (agriculture) programs will be adopted via a combination of extension methods and incentive payments to farmers.

3.1 Fenced Nesting Cover

Cropland that is purchased and managed as dense nesting cover (DNC) should be acquired in a minimum of 40 ac. blocks in areas of high wetland density and in association with secure brood habitat. Three blocks per township would be acquired, seeded to cool-season native-grass species (to reduce future management costs), and secured from predators with electrified fencing. After cover establishment, predator removal from within the compound would be required early each spring, and fence maintenance would be needed weekly through the nesting season. Cover management using burning is proposed at five-year intervals and fence life is estimated at 20 years. Crows and ground squirrels may have to be controlled within the enclosure. Where blocks of existing cover are already owned by wildlife interests, they may simply require cover management and fence establishment. In other cases, breaking and seeding would be required.

3.2 Unfenced Nesting Cover/Inter-pothole Seeding 8.

This treatment would be applied to some purchased and if predator fencing were not feasible or warranted. As a lower priority, it might also be applied to land acquired through short-term easements of up to 15 years, where fencing would not be cost-effective. Such cover generally would be managed in its existing state (pasture, hayland, or native) by using: 1) fire management, 2) by interseeding with legumes, or 3) if already broken, seeding to cool-season introduced species. Cost of native species is not warranted on land held with short-term easements. Again, cover management is prescribed at five-year intervals, but more regular treatments or even reseeding might be required on land held longer than ten years. Market value payments generally would apply, but right-of-way (ROW) restoration and inter-pothole habitat seeding are exceptions. In the case of ROW's, free easement agreements would be sought with municipalities to re-establish and maintain cover on previously cropped or abandoned areas. In order to acquire easements on odd areas in cropped wetland complexes and seed them to cover, landowners would be offered payments at the rate of land tax. Under this latter program and all others not involving land purchase, farmers would retain their grain quota delivery rights, but to qualify, be required to sign long-term free easement agreements to retain wetlands on the designated acreage.

3.3 Nesting Baskets

Mallard nest baskets are proposed for installation at a rate of one per permanent wetland (Class III-V). In southern Manitoba, this method would be a priority only on lands with good wetland densities and where upland cover improvements are not feasible.

Open structures would be installed in the first year to facilitate nesting. Once used, the open structures would be replaced with a covered structure in order to increase nest success. Annual inspection would be required to monitor use, provide maintenance, and replace nesting material. Monitoring would be accomplished via landowner contract. Structure life is predicted at seven years with 30% use and 80% nest success. Evaluation of benefits is warranted early in implementation.

4.0 SOIL AND WATER CONSERVATION PROGRAMS

4.1 Demonstrations

All management plans in this category are based on informing farmers about alternate land use practices through field demonstrations. If adopted, these practices would be economical and compatible with upland nesting waterfowl. Promotion of such practices is inexpensive because wide-scale incentive payments would not be required. Changes in land use, as a result of acceptance,

would generally promote improved soil and water conservation, and as a spin-off, lead to improved recruitment of upland nesting waterfowl. A 1987 survey of Alberta grain producers indicated that the majority would be in favor of adopting such methods if they could see them being used successfully by others they knew (L. Fullen pers. comm.). Ducks Unlimited Canada has used field demonstrations successfully to promote such methods on a small scale since 1983.

With the aid of Manitoba Department of Agriculture (MDA) field representatives, individual farmers would be selected and assisted in trying a particular farming practice. Demonstration sites would be established and field tours would be arranged. It is anticipated that a proportion of people viewing the demonstration site would subsequently adopt such methods on their own. As an example, one or several demonstrations per township might be required to reach all farmers. For each plan, land use, geographic conditions, and other constraints were used by the technical committee to predict the number of demonstrations required and landowner acceptance rates.

a) Rotational Grazing. This method would be promoted to replace conventional grazing systems, which are characterized by the presence of cattle during the nesting season and low success by nesting ducks. A typical demonstration site would comprise 200 ac. with 40 ac. of fertilized tame pasture, and 160 ac. of native pasture divided into three or four paddocks by high tensile, solar-electrified fencing. Cooperators would provide their own labor and equipment and would be supplied with fencing materials, seed, herbicide and fertilizer to establish the system.

Cattle would begin to graze one tame paddock in late May and be moved twice (at about seven-day intervals) through the tame paddocks. To maintain some cover and a vigorously growing pasture, cattle would be moved when grass was grazed down to a height of about four inches. Grazing of the first native paddock would not begin before late June, and most nesting would be completed in several of the native paddocks before any grazing began in them.

It is expected that stocking rates, livestock feeding efficiency, and other benefits would be accrued by ranchers while concurrently increasing waterfowl production from pastures by up to fourfold.

b) Chemical Fallow. In southwestern Manitoba, 20% of cropland is estimated to be fallowed annually. Typically, tillage operations conducted for weed control eliminate any value of these areas to nesting waterfowl. Demonstration chemical fallow areas would be established to promote the replacement of conventional methods in areas where fallowing is a viable method of conserving soil moisture. In areas where this is not the case, continuous cropping rotations would be promoted.

In the chemical fallow system, weed control would be accomplished with chemicals rather than tillage. Standing dead vegetation would reduce soil erosion and provide some undisturbed cover for nesting waterfowl. Presently, the high cost of chemicals does not make chemical fallowing an attractive alternative to farmers. However, where infestation of grassy weeds is not a severe problem, "Rustler," a new economical hybrid of "Roundup" and 2-4-D, can be effective and comparable in cost to conventional fallowing.

Demonstrations would be established on 100 ac. fields in appropriate townships (selected according to land type and wetland density). Up to half of the herbicide costs would be subsidized for cooperators. It is estimated that conventional fallowing varies in cost from $12-$15/ac. A wide-scale herbicide subsidy may be required to see the expected degree of acceptance of this technique, presuming ongoing studies will show little detrimental effect of herbicides on wetlands adjacent to cropland. Over the longer term, reduced costs, development of new herbicides, and changes to patent laws should result in increased acceptance of chemical fallowing.

c) Stubble Mulch Fallow. Another alternative to conventional fallowing in drier parts of the province is stubble mulching. This method involves the use of an undercutting implement that severs weeds below the surface but leaves the dead plant standing to afford soil cover and nesting habitat. As part of the demonstrations on 100 ac. fields, an implement would be loaned to cooperating farmers.

d) Winter Wheat/Minimum Till. In some cases, establishment of minimum-till winter wheat can be an alternative to spring-seeded crops. At demonstration sites, specialized implements would be loaned to cooperators so they could seed directly into standing stubble in the fall. The following spring, chemical weed control would be done by the cooperators. Farming benefits of this practice include: 1) reduced soil erosion, 2) ability to take advantage of early spring moisture, 3) capability of harvesting crops earlier in the summer in areas susceptible to depredation by birds, and 4) a 25% increase in yield above that of spring wheat. Benefits to nesting waterfowl occur because undisturbed cover is available through the spring.

Presently, there are technological problems with this method. Incomplete cold-hardiness can result in winter mortality, and the present strains are not resistant to rust molds. In addition, winter wheat grains are not equal in quality to hard spring wheats, resulting in lower market prices. As such, there is presently limited interest in this crop in Manitoba. It is expected that development of new cold-hardy and disease resistant hybrids within the next five years will increase its acceptability.

The management plans in this category focus on influencing present land use and are based on incentive payments, either in total or on a cost-shared basis. Proposed programs are relatively expensive to implement and practices would not continue if payments were discontinued.

a) Drought Proofing. It is proposed that funds be used to establish and maintain hay cover on marginal and/or erodible cropland so as to retire land from production for at least ten years. A recent proposal by the Prairie Farm Rehabilitation Administration (PFRA) calls for implementation of a similar program whereby up to 7.0M ac. of marginal cropland on the Canadian prairies would be returned to forage production. Waterfowl populations in these areas would benefit if a cooperative agreement were reached between the NAWMP and PFRA to deliver such a program.

In this proposal, farmers could harvest hay after 15 July on an average of two years in ten, but only when the provincial government determines that a severe drought has reduced the availability of forage. Periodic cutting or burning would be required, in any case, to maintain the vigor of the stand. Thus, in eight of ten years, undisturbed cover would be available for nesting waterfowl.

b) Delayed Hay Cut. Presently, it is assumed that the majority of farmers take two cuts, the first initiated around 1 July. Under this proposed program, it assumes that farmers would be subsidized at the rate of $7/ac. each year to delay the first cut on established tame hay fields until after 15 July. Payments would be scaled to reimburse farmers for lost protein, lower overall yields, and increased weather-related risk of harvesting hay. This program should ensure that the majority of nests established in such fields would hatch before harvest.

Landowner compliance in this program may be low, particularly under certain environmental and economic conditions. Therefore, the incremental waterfowl benefits achieved with this program may be limited. Possibly, hay produced under the drought proofing program could be made available when necessary to increase compliance. Evaluation of a pilot program is warranted prior to full implementation.

4.3 Policy Issues

Meeting Manitoba's waterfowl population objectives will depend upon implementing the type of direct habitat improvement programs described previously. However, an equal importance is maintaining the quality and the quantity of existing habitat, both within the outside target areas (see Results). Government policies at various jurisdictional levels require review and possible revision to ensure that their influence on land use is compatible with waterfowl habitat conservation and enhancement.

The objectives sought in reviewing government policy are:

1) to preserve, for wildlife, wetlands and native uplands which are of marginal value for agricultural production, and

2) to provide the economic incentives that induce farmers to practice conservation farming methods that also benefit waterfowl habitat.

Five policy areas in which change is desirable to accomplish these objectives are described in the following sections:

a) Grain Quota - The grain quota system should not penalize a farmer who preserves wildlife habitat. The current review of quota policy by the Canadian Wheat Board has proposed that a farmer be entitled to a delivery minimum regardless of land base. Farmers could contract for additional volumes due to larger farms, high inventories, high crop yields, etc.

The proposed quota concept has merit from the wildlife perspective and deserves support. If the existing system is to be retained farmers should be allowed to claim quota land base for wetlands and uplands that are retained in their natural state.

b) Municipal Taxation - There should be no property tax on wetlands and native uplands in rural municipalities where such lands could otherwise be developed for agricultural use. The zero assessment rate should be clearly indicated on taxation notices. Te resulting lost revenues to the municipalities should be funded from provincial revenues. This would help to assure that society which receives benefits from the retention of lands in their more natural state, such as reduced downstream flooding, sediment and pollution control, protection of native flora and fauna, and waterfowl production, would play a significant role in assisting and encouraging farmers who provide these benefits on private lands.

c) Herbicides - Cropping systems which reduce or eliminate tillage are beneficial to waterfowl production. The movement to minimum and zero tillage in western Canada has been slow because of disproportionately high prices for key herbicides. This seems to be due primarily to Canada's federal patent laws which reduce

competition by unduly protecting manufacturers from the marketing of generic products. The price of herbicides now under patent is up to ten times that of those not protected by patent law. A change in policy should be sought to provide a patent period on herbicides to no longer than necessary to provide for a fair corporate return relative to investment and risk. Additionally, research should be promoted to develop effective, environmentally save and less expensive herbicides and other pesticides for use in the farming industry.

d) Water Management - Retention of water runoff should be encouraged by strict enforcement of the Provincial Water Rights Act to prevent indiscriminate drainage. Incentives are needed to encourage farmers to adopt practices that retain snow melt and rainfall on farmlands. More dams should be emplaced on Manitoba's escarpment to reduce runoff and to provide additional opportunity to develop wildlife habitat. In addition, government funding to Manitoba's Conservation Districts should be contingent upon conservation of existing waterfowl and other wildlife habitat.

e) Income Tax - Income tax deductions should be disallowed for the costs of any drainage, clearing and breaking that is not licensed by the appropriate provincial regulating agencies. A review board, with representation from wildlife agencies, shoudl regulate these activities.

f) Conservation Programming - Federal and provincial soil and water conservation programs should be supported by wildlife agencies and organizations. In general, the activities regarding research and development, technology transfer and financial incentives proposed in soil and water conservation programming are very beneficial to waterfowl and other wildlife resources.

g) Waterfowl Damage Prevention - The current level of compensation for the losses of cereal grains from waterfowl is inadequate at 51%. This program is cost-shared 50:50 between the Federal Department of the Environment and Provincial Department of Agriculture. The success of the Manitoba Implementation Plan is dependent upon a much higher level of compensation, between 80%-100%.

5.0 COMMUNICATIONS STRATEGY

A program of public information and education is a mandatory requirement prior to and during the implementation phase of the Manitoba plan. This program is absolutely necessary to gain the public's acceptance, support and their confidence for the NAWMP. Because it is an important component of the implementation process, a qualified public relations firm should be retained to first design, develop, train staff and then manage the actual delivery of the program itself.

The specific aspects or components of this program should be based on a communications strategy for the Prairie Habitat Joint Venture. Again this strategy would be developed best by a qualified Public Relations Firm.

6.0 MANITOBA HERITAGE MARSH PROGRAM

An ancillary program which protects and maintains molting and staging habitat for Manitoba's waterfowl is the Heritage Marshes. It is a co-operative venture among Manitoba Department of Natural Resources, Ducks Unlimited Canada, Manitoba Naturalists Society, Manitoba Wildlife Federation, and Wildlife Habitat Canada. In general, Heritage Marshes are large wetlands (+500 ac.) which are important as waterfowl molting and staging areas. These marshes will provide molting and staging habitats for fifty percent of the increase of 185,000 Mallards during the non-breeding portion of the year.

The Heritage Marshes, because of their size and permanency, provide a refugium for waterfowl during periods of drought. Heritage Marshes outside the target area and within the target area itself will provide the essential food and habitat requirements to maintain waterfowl populations through these difficult periods.

Although these marshes are large and permanent, their condition and even existence is threatened in many cases by agricultural encroachment and drainage activities. Others are threatened or have been impacted by hydro-electric developments. Impacts from residential, industrial and recreational development also are of concern.

The Heritage Marsh Agreement lists five marshes as Heritage Marsh sites (Figure 3). An additional eleven marshes are listed as primary candidate marshes and nine as secondary candidate marshes. These twenty-five marshes account for more than fifty percent of the present molting and staging habitat for mallards in Manitoba.

Of the twenty-five marshes, five are within the area targeted for the Manitoba Implementation Plan. These marshes are Oak-Plum Lake Marshes, Whitewater Lake, Lidcliff Marshes, Proven Lake Wildlife Management Area (W.M.A.) and the Hunter Maple Lakes Marshes. Further, two other primary candidate Heritage Marshes are within 30 miles. These are the Delta and Big Grass Marshes.

The goal of the Heritage Marsh Program is to declare ten Heritage Marshes during the agreement period. Because of the multi-disciplinary land use conflicts involved in preserving these valuable marshlands, a land use and consultation process will be used to establish each heritage marsh and to develop management plans for these marshes aside from the NAWMP.

These marshes will provide the staging habitats for the ducks produced by the Manitoba Implementation Plan. Further, each marsh will contribute some waterfowl production. The extent of this production is difficult to evaluate and no attempt has been made to factor this into the implementation planning.

7.0 WATERFOWL DAMAGE CONTROL

The waterfowl resource is not without its debits, as ducks, especially mallards and pintails, consume large amounts of cereal grain crop during some falls. Although many farmers experience some degree of crop damage by waterfowl, those farmers adjacent to staging marshes, like the Heritage Marshes, could have more severe losses on a more frequent basis. There is a perception that more ducks will result in more crop damage. This is not necessarily the case as there is no clear link between populations and damage.

Two factors have brought grain production and waterfowl staging areas into closer proximity. Firstly, the draining of marshland has resulted in the loss of many small marshes and the enhancement through development, of fewer but larger wetland areas which concentrate a large number of waterfowl in localized areas, e.g. Delta, Oak Hammock Marsh. Secondly, marginal lands which previously were considered not suitable for grain production now are being cultivated for cereal crops. Some landowners drain wetlands specifically to reduce or perhaps even eliminate further crop damage by waterfowl. The landowner's attitude towards waterfowl is not favourable. An enhanced Damage Control Program could serve as an effective public relations tool and incentive to landowners to gain the landowner's support for the Manitoba Implementation Program.

Waterfowl production programs must consider enhanced damage control measures. To introduce a major program to increase waterfowl production without adequate safeguards to minimize crop damage, would jeopardize the initiative's acceptance and support by landowners.

Of the mallards produced within the target area many will stage on the large marshes in southwestern Manitoba. The fall flight of mallards is projected to increase by 108,300. This projection does not include the additional pintails or mallards produced in eastern Saskatchewan which likely will stage on large marshes in Manitoba.

Crop damage from waterfowl will be minimized as populations increase. Under the Manitoba Implementation Plan of the NAWMP, the objective of the Damage Control Program would be to lessen or minimize waterfowl caused damage to crops from waterfowl through prevention.

The projected cost for additional damage control is expected not to exceed $200,000 annually. This is based on the number of additional ducks produced directly through the NAWMP. However, farmers will not differentiate between the ducks produced in the target areas to migrant ducks from outside the target areas to migrant ducks from outside the target areas. Consequently the existing Waterfowl Crop Damage Prevention Program must be increased by 50% above its current level of $425,000 to $675,000. This additional funding will be required to expand services currently available in some areas but through Manitoba.

HERITAGE MARSHES

1. GRANT'S LAKE
2. OAK HAMMOCK
3. PROVEN LAKE
4. SASKERAM W.M.A.
5. SUMMBERBERRY
6. DELTA
10. LIDCLIFF

I. CANDIDATE HERTIAGE MARSHES

7. OAK-PLUM
8. NETLEY-LIBAU
9. BIG GRASS
11. DENNIS LAKE
12. WHITEWATER LAKE
13. TOM LAMB W.M.A.
13. TOM LAMB W.M.A.
14. MARSHY POINT
15. TURTLE RIVER
16. DOG LAKE

II. CANDIDATE HERITAGE MARSHES

17. SHOAL LAKES-VESTFOLD
18. PINEMUTA-LAKE ST. MARTIN
19. BIG POINT
20. LIZARD LAKE
21. RAT RIVER SWAMP
22. HECLA
23. PORTIA
24. REYKJAVIK
25. HUNTER-MAPLE

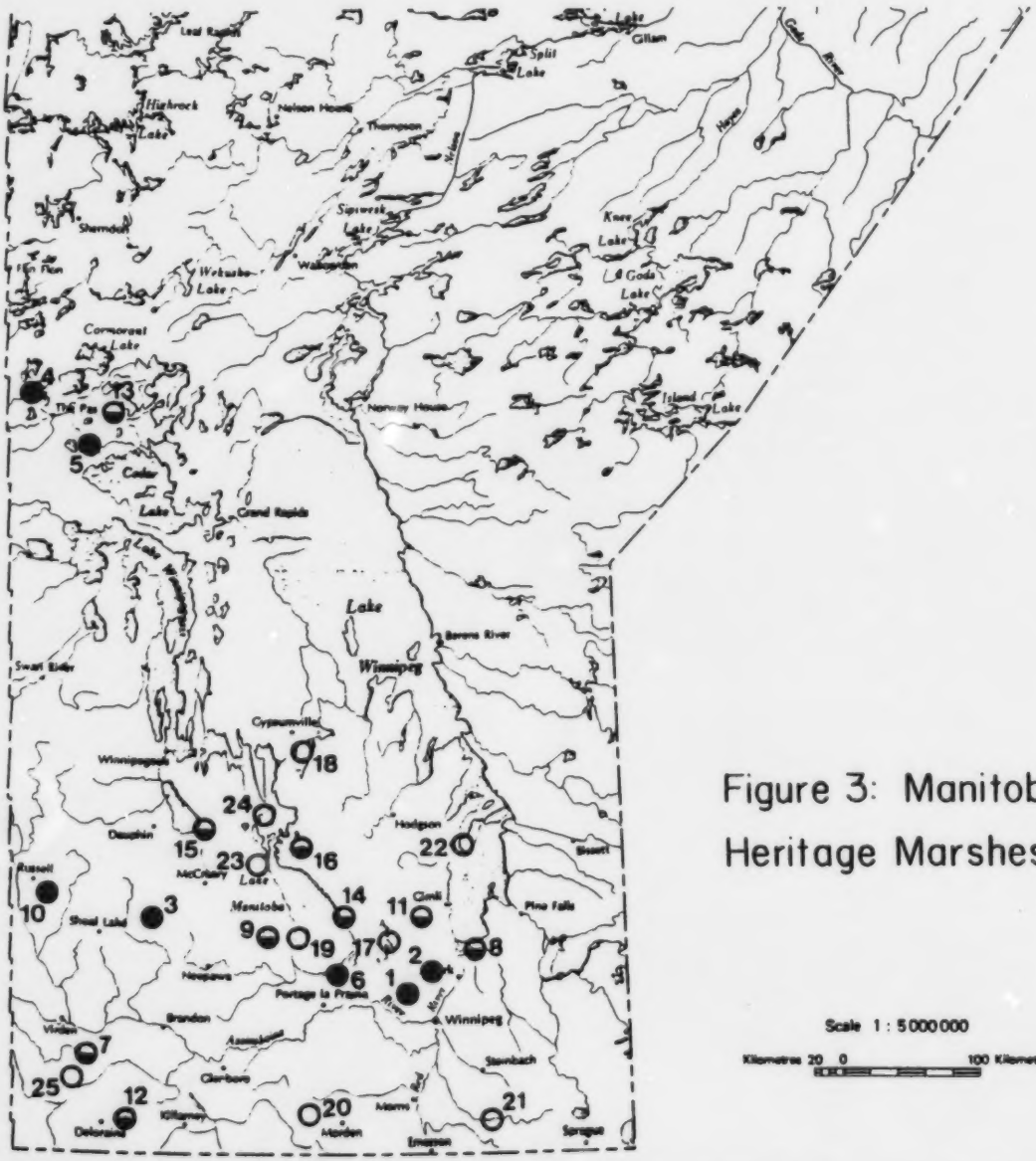

Figure 3: Manitoba Heritage Marshes

Cartography by: Surveys and Mapping Branch, Manitoba 1980
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8.0 EVALUATION

Continual evaluation is required to determine the progress towards achieving Manitoba's waterfowl population objectives. Those programs requiring the greatest resources and projected to produce the most ducks will be evaluated first. Evaluations would begin prior to, or at least concurrent with, implementation. Habitat in selected study areas would need to be developed to permit sound evaluations of these programs. Generally, important assumptions made during the planning process about nesting use and success of certain cover types would be tested.

In addition to the long-term evaluations of the relative attractiveness and success of treated covers, monitoring of changes in land use and waterfowl populations will be carried on as a cooperative effort among agencies. Concurrently, a multi-disciplinary group of advisors will continue to identify policies for change that promote land use practices running counter to Manitoba's NAWMP objectives. They will identify and prioritize soil and water conservation issues for the PHJV. More intensive research studies addressing biological and sociopolitical issues will be commissioned as needed to answer specific questions.

Field data will be collected by Manitoba's NAWMP staff in cooperation with a central evaluation group whose primary function will be to participate in all PHJV evaluations. Data supplied to this central group would be used to compile annual reports for the PHJV, indicating progress toward provincial objectives.

As the habitat development program continues, implementation staff will compare costs relative to planned budgets, measure program acceptability, and in some cases, landowner compliance. Programs like the Habitat Enhancement Land Use Program (HELP), an ongoing pilot project in the Rural Municipality of Shoal Lake, also will provide guidance for implementation strategies in Manitoba.

Manitoba's implementation plan will be modified when new information becomes available from various evaluation programs. This process will ensure that resources will be allocated in the most efficient manner possible as the habitat programs are implemented over the next 15 years.

9.0 RESULTS

All simulated waterfowl production results are presented in this section as expected during the last five years of the implementation program in years with average pond conditions. Baseline runs of the CPT model assume no significant upland or wetland habitat change over time from the present. Waterfowl production objectives will be met only if the current upland and wetland habitat base is maintained through indirect programs.

The models used to estimate duck production resulting from the proposed habitat program are based on the best information available about mallard breeding biology. Far less information is available about other species. Therefore, total ducks were estimated by extrapolating from mallard estimates. Predictions of how other upland nesting ducks will respond to cover improvement, based on mallard biology, is questionable at best. For a crude estimate of total upland nesting species production, multiply mallard production by 3.9. This is based on the proportion of mallards that comprise the upland nesters in the target zones. Over-water nesters are assumed to be unaffected by the proposed habitat program.

9.1 Habitat Changes

The program would be implemented on a land base (baseline habitats) of just over 3.3 million acres, of which 2.7M is "improved." Of this 2.7M acres of improved land, 1% would be converted from agricultural production by direct programs, to intensively managed wildlife cover. Soil and water conservation would be improved on 14%, and 4% would be converted to another agricultural use.

Over the last five years, implementation of the proposed plan calls for an average of 27,000 ac. of intensively managed waterfowl habitat cover, 472,000 ac. of land use modifications on agricultural land, and 3900 nesting baskets (Table 1). A total of 499,000 acres of land will have modified land use in the target zone as a result of the program.

The program would be implemented progressively following a gradual start-up period (Figure 4). Nest baskets and other intensive treatments would peak in year ten at 3900 structures and 32,000 ac., respectively. The area in intensive treatments would begin to decline thereafter as leases on some projects expire. Extensive treatments would comprise 15% of the land area and reach a maximum of 501,000 ac. in year 14.

The plan would affect various types of land differently. Erodible cropland would be converted to hay cover (4% of stubble cropland ac.) for use as emergency forage during drought. Other cropland would be converted to fall- seeded crops (7% of cropland ac.), and 1% would be converted to intensively managed nesting plots. Chemical fallow and stubble mulch would be adopted on 36% of the conventional fallow land and hay cuts would be delayed on 10% of existing hayland. Pastures would be improved by installation of rotational grazing systems on 28% of the grazed acreage. Conversion of 1% of the hayland and 1% of the pasture areas in the target zones to managed nesting cover completes the proposed program.

Changes in land use would be accomplished through extension programs, incentive payments, land purchases, and leases from landowners. Of the total upland acreage on which cover will be improved, agricultural extension programs would account for changes on about 74%

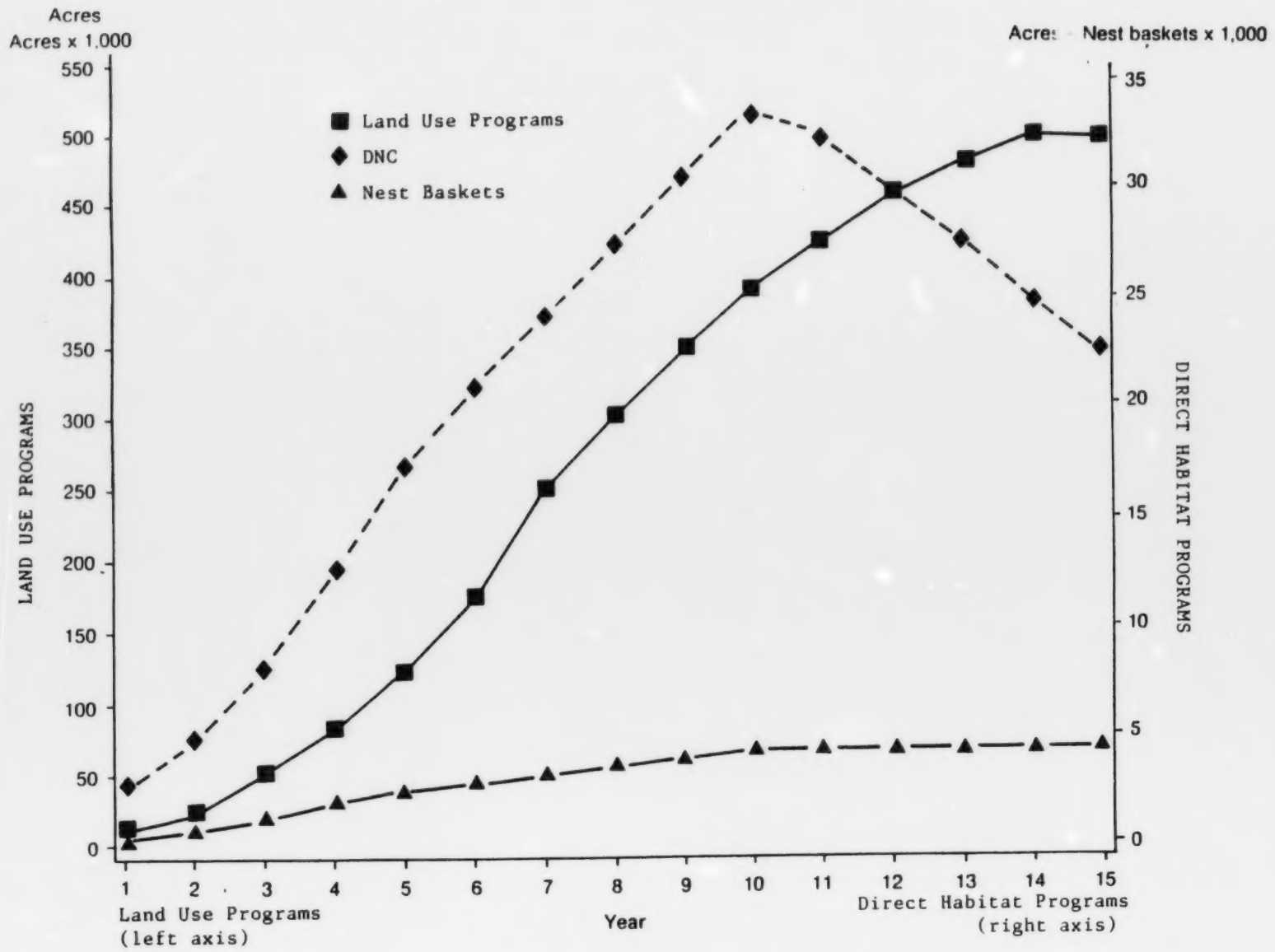

Figure 4. Proposed implementation of habitat programs over time.

of the area. Incentive payments (for delayed hay cuts and seeding of marginal cropland) would secure another 21% of the habitat program acreage goals. The remaining 5% of the acreage would be achieved with purchases (3%), leases (1%), and free easements on existing crown pastures (<1%).

Land will be purchased when large capital costs are incurred to improve nesting cover tracts, such as for predator-proof fences. About 73% of the dense nesting cover (DNC) would be fenced and 75% will be purchased, including all fenced and some unfenced cover plots.

9.2 Recruitment

The above changes in habitat will produce an estimated 28,000 incremental mallard recruits inside the targeted zones. Breeding hens will gradually select the more secure managed sites for nesting. As such, the original cover types are expected to produce 22,000 fewer recruits while the improved habitat types will produce just under 50,000 additional recruits (30,700 intensive plus 19,300 extensive). This would result through generally improved hen success (Table 1) in the more attractive cover types.

Intensively managed cover will produce most of the additional recruits. Fenced cover, while comprising less than 1% of the upland habitat area, would produce an estimated 29% (24,500) of the mallard recruits. The extensive habitat treatments would produce 23% of the recruits. Following implementation, the original habitats are expected to produce 41% (34,000), and the improved habitats to yield 59% (50,000) of the annual mallard production.

While nest success rates generated by the simulations generally reflect input parameters, nest densities are a product of the relative attractiveness of various cover types and pair densities. Fledged recruits produced from each cover type are a reflection of expected nest density and success. Nest success rates, expected nest densities, and fledged recruits for each cover type in the target zones are presented in Table 2.

In our simulations, nest success ranged from below 10% in right-of-ways (8.5%) and cropland (9.3% and 3.8%) to above 54.0% in fenced cover and 81.4% for nesting baskets (Table 2). Overall, nest success improved from 14.4% to 21.8% (Table 3) through birds being attracted into more successful cover types. High nest densities were projected in planted cover where relatively high success is expected. As attractive cover was added to the simulated landscape, nest densities in all baseline cover types declined even though pair densities were increasing (Figures 5 and 6).

Table 1. Cover type changes and estimated mallard recruits as a result of program implementation in Manitoba target areas.

Cover Type	Pre-treatment Acres[a] 000's #	%	Pre-treatment Mallard Recruits[b] 00's #	%	Post-treatment Acres[a] 000's #	%	Post-treatment Mallard Recruits[b] 00's #	%
Baseline Habitats[c]								
Brushland	6	<1	11	2	6	<1	7	<1
Cropland - stubble	1648	54	13	2	1431	47	5	1
Cropland - fallow	412	14	10	2	264	9	4	<1
Emergents	111	4	121	22	111	4	81	10
Hayland	293	10	136	24	263	9	84	10
Other	10	<1	13	2	10	<1	8	1
Pasture - grass	358	12	55	10	255	8	26	3
Right-of-way	81	3	33	6	81	3	18	2
Woodland	127	4	164	30	127	4	107	13
Subtotal	3046	100	556	100	2548	84	340	41
Direct Waterfowl Habitat Options								
Intensive Treatments								
DNC - fenced	-	-	-	-	16	<1	245	29
DNC - unfenced	-	-	-	-	6	<1	25	3
Inter-Pothole Seeding	-	-	-	-	5	<1	2	<1
Nesting Baskets	—	—	—	—	4[d]	—	39	4
Subtotal	-	-	-	-	27[c]	<1	307	36
Land Use Modification Options								
Chemical Fallow/Stubble Mulch	-	-	-	-	148	5	7	1
Delayed Haying	-	-	-	-	29	1	13	2
Winter Wheat/Minimum Till	-	-	-	-	123	4	50	6
Rotational Grazing	-	-	-	-	100	3	54	6
Drought Proofing	—	—	—	—	72	2	69	8
Subtotal	-	-	-	-	472	15	193	23
Total	3046	100	556	100	3046[e]	100	840	100

[a]Average over last five years of program for target areas in Manitoba.
[b]Simulated densities in a year with "average" water conditions. To estimate total upland nesting waterfowl recruits, multiply mallard recruits by 3.9.
[c]Note only baseline habitats are available prior to implementation and that some of this habitat is transformed following implementation.
[d]Number of nesting baskets.
[e]Totals do not include nesting baskets.

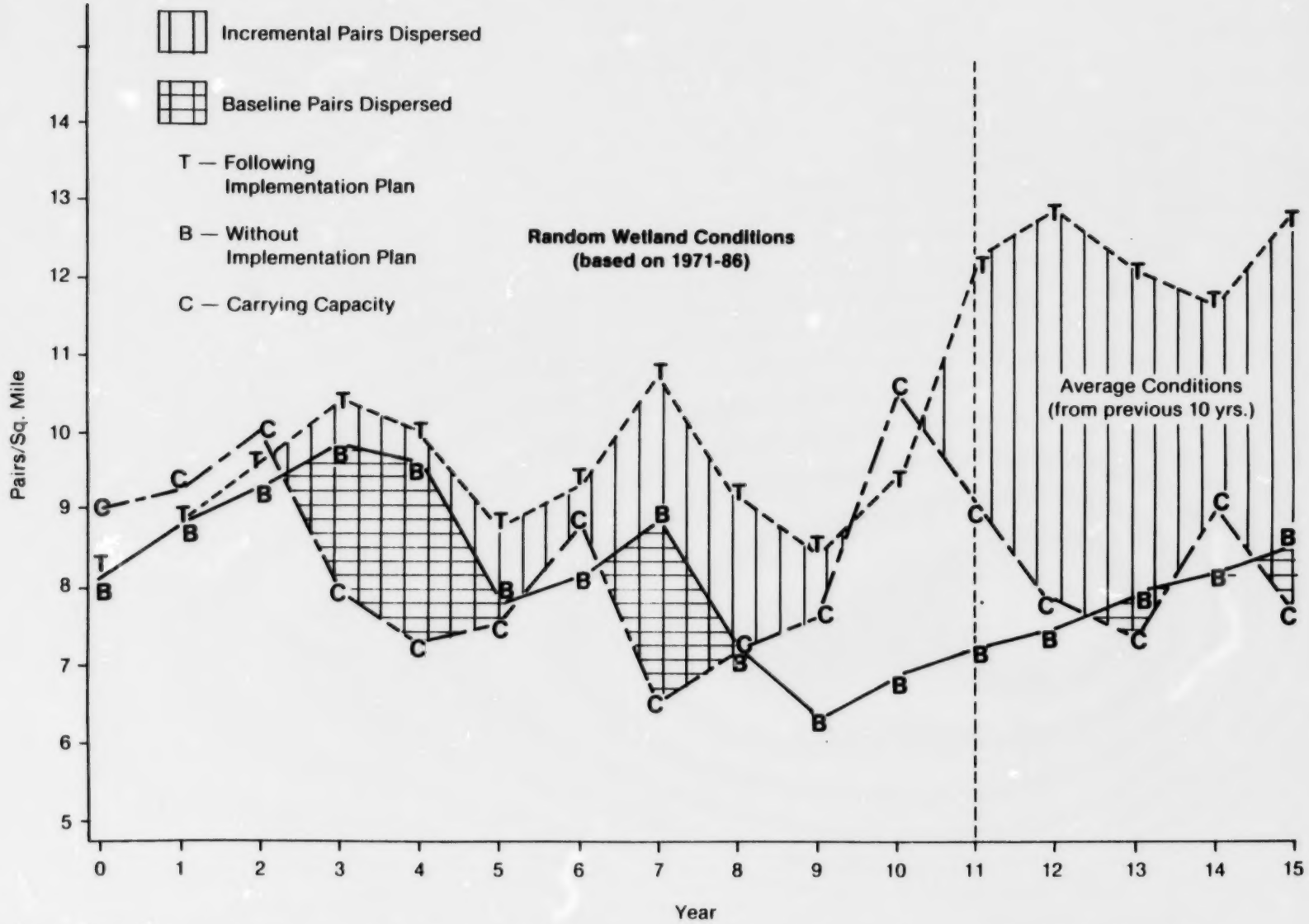

Figure 5. Results of simulations, in relation to carrying capacity, for Stratum 39 pair densities over the proposed 15-year plan.

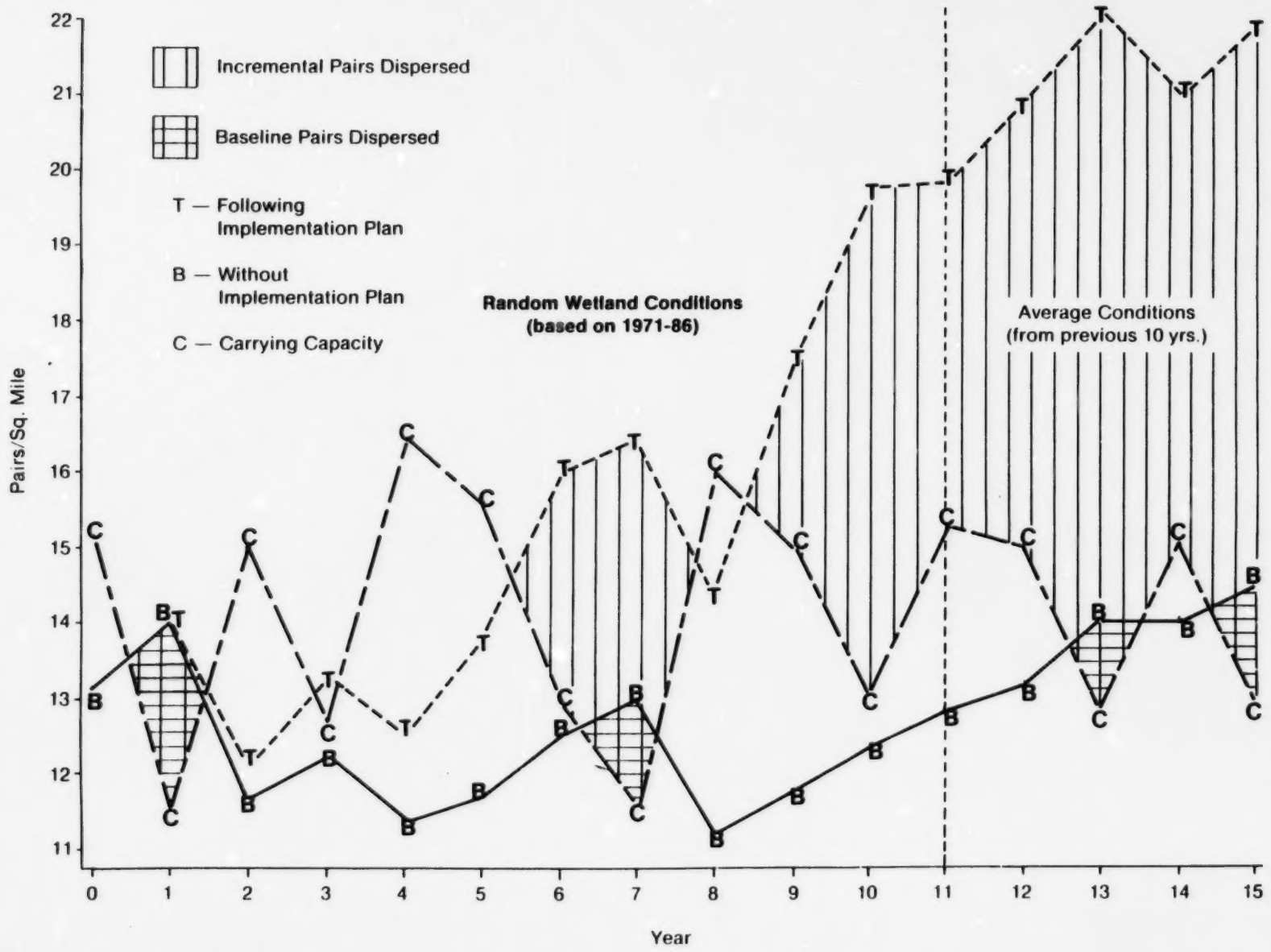

Figure 6. Results of simulations, in relation to carrying capacity, for Stratum 40 pair densities over the proposed 15-year plan.

The simulated effects of the proposed habitat changes on several other population parameters are shown in Table 3. Hen success, fall age ratios, and recruitment rates are expected to increase by about 35-40% during average years. The rate of population change in the targeted areas is expected to increase by approximately 16% over the current rate of change, which is virtually stable (see The Canadian Prairie Habitat Joint Venture 1987).

Although 7% fewer nests will be initiated by hens, hen summer survival rates are not expected to improve significantly in response to the proposed program. Fewer nests would be initiated because hens would be more successful at hatching their first nests. However, the number of hens predated on nests would apparently be unaffected even though exposure to predation would be reduced.

Simulations indicate that average fledged brood size will remain constant at about 3.8 ducklings/hatched nest. This is not surprising because no change is assumed in the daily survival rates of ducklings in response to upland habitat improvements.

Table 2. Average mallard nesting success, and recruits estimated in the baseline cover types and the treatment runs (Intensive and Extensive) of the Mallard Production Model over five average years (1997-2001).

Cover Type	Nests/100 ac.[a]			Recruits/100 ac.[a]	
	Nest Success (%)[a]	Pre[b]	Post[b]	Pre	Post
Baseline Habitats					
Brushland	17.5	32.9	20.7	21.4	14.5
Cropland - stubble	9.2	0.3	0.1	0.1	tr
Cropland - fallow	3.8	1.6	1.2	0.2	0.1
Emergents	16.9	16.2	10.9	10.8	7.2
Hayland	13.9	8.8	5.7	4.6	3.2
Other	10.4	24.7	18.4	12.4	7.4
Pasture - grass	14.4	3.0	1.9	1.6	1.1
Right-of-way	8.5	10.7	7.1	4.0	2.3
Woodland	18.5	17.3	11.5	12.6	8.2
Direct Waterfowl - Options					
DNC - fenced	54.0	-	75.3	-	148.9
DNC - unfenced	22.9	-	48.4	-	40.3
Inter-Pothole Seeding	16.1	-	5.6	-	3.7
Nesting Baskets	81.4	-	24.5[c]	-	78.6[c]
Land Use Modification Options					
Chemical Fallow/Stubble Mulch	8.8	-	1.4	-	0.4
Delayed Haying	18.7	-	6.4	-	4.5
Winter Wheat/Minimum Till	20.6	-	5.8	-	4.2
Rotational Grazing	32.6	-	4.5	-	5.5
Drought Proofing	20.6	-	12.3	-	9.6

[a]Average for densities and success observed in Strata 39 and 40 assuming equal weighting. Multiply densities by 3.9 to estimate total upland nesters.

[b]"Pre" refers to simulations assuming no change in upland areas and average conditions from 1997-2001. "Post" refers to the average conditions of wetlands and uplands after implementation is complete (i.e., 1997-2001).

[c]Per 100 nesting baskets.

Table 3. Population parameters estimated during average wetland conditions following implementation of the proposed plan.

Parameter	Pre[a] %	Post[a] %	Change (%)
Nest Success (%)	14.4	21.8	51
Hen Success (%)	26.9	37.5	39
Nests/Hen	1.86	1.72	- 7
Summer Hen Survival	0.77	0.78	1
Fall Age Ratio	0.63	0.87	38
Recruitment Rate[b]	0.51	0.70	37
Population Change Rate	1.05	1.22	16

[a]"Pre" refers to simulations assuming no change in upland areas and average conditions from 1997-2001.
"Post" refers to the average conditions of wetlands and uplands after implementation is complete (i.e., 1997-2001).

[b]"Recruitment Rate" - females fledged per spring breeding female.

9.3 Pair Populations

If pair populations were not constrained to densities observed during the period 1971-86, the simulations suggest average pair densities of 12-13 and 21-22 mallard pairs per square mile would result in the target zones of Strata 39 and 40, respectively (Figures 5 and 6). However, historical counts indicate that pair populations during average years should not exceed about 8-9 and 14- 15 pairs/mi^2 in Strata 39 and 40, respectively. Assuming nesting success has not been a limiting factor to building past high pair densities, a growing pair population was constrained to the above historical densities in the target zones. All pairs returning to the target zones above these levels were assumed to disperse to non-targeted surrounding areas (see Appendix 1 for details). This is a key assumption that needs to be tested, therefore the above approach is conservative.

As a result of nesting habitat improvement, an increase is projected in annual average mallard populations in the target zone from 110,000 to about 119,000 mallards during the last five years. At the same time, about 54,000 additional mallards would disperse to surrounding habitats according to the simulations (Table 4).

9.4 Production: Target vs. Non-Target Areas

Incremental mallard production would occur in both the targeted and non-targeted zones in Manitoba (Figure 7) when carrying capacity is exceeded in the target areas. In average years, about 50% of the incremental recruits would be produced by pairs dispersing into the non-target zones. These pairs comprise 85% of the incremental pairs and yield 67% of the estimated incremental fall flight of mallards.

Following implementation, simulations suggest 29% of the mallard spring breeding population will settle in the target zones and the spring population in southern Manitoba will have increased by 63,200 to 417,000 BIRDS. At that level, 104% of the goal of 400,000 spring mallards (Table 4) would have been achieved.

While the mallard spring breeding population goal seems achievable with the proposed habitat program, goals for recruits and fall flights may not be realistic. These goals, as set out in the Manitoba prospectus, may not be attainable with a breeding population of 400,000 mallards. The simulations indicate that projected age ratios (1.11), hen success (43.5%), and fledged brood size (5) were too high. All would have biased the projected fall flight and fledged recruit estimates upward. These original estimates were derived from wing surveys, brood observations, and crude estimates of hen success based on age ratios and estimated brood size at fledging (see NAWMP prospectus April, 1987).

Alternatively, assumed age ratios for non-targeted areas may be low at 0.65, although the model projected baseline age ratios of

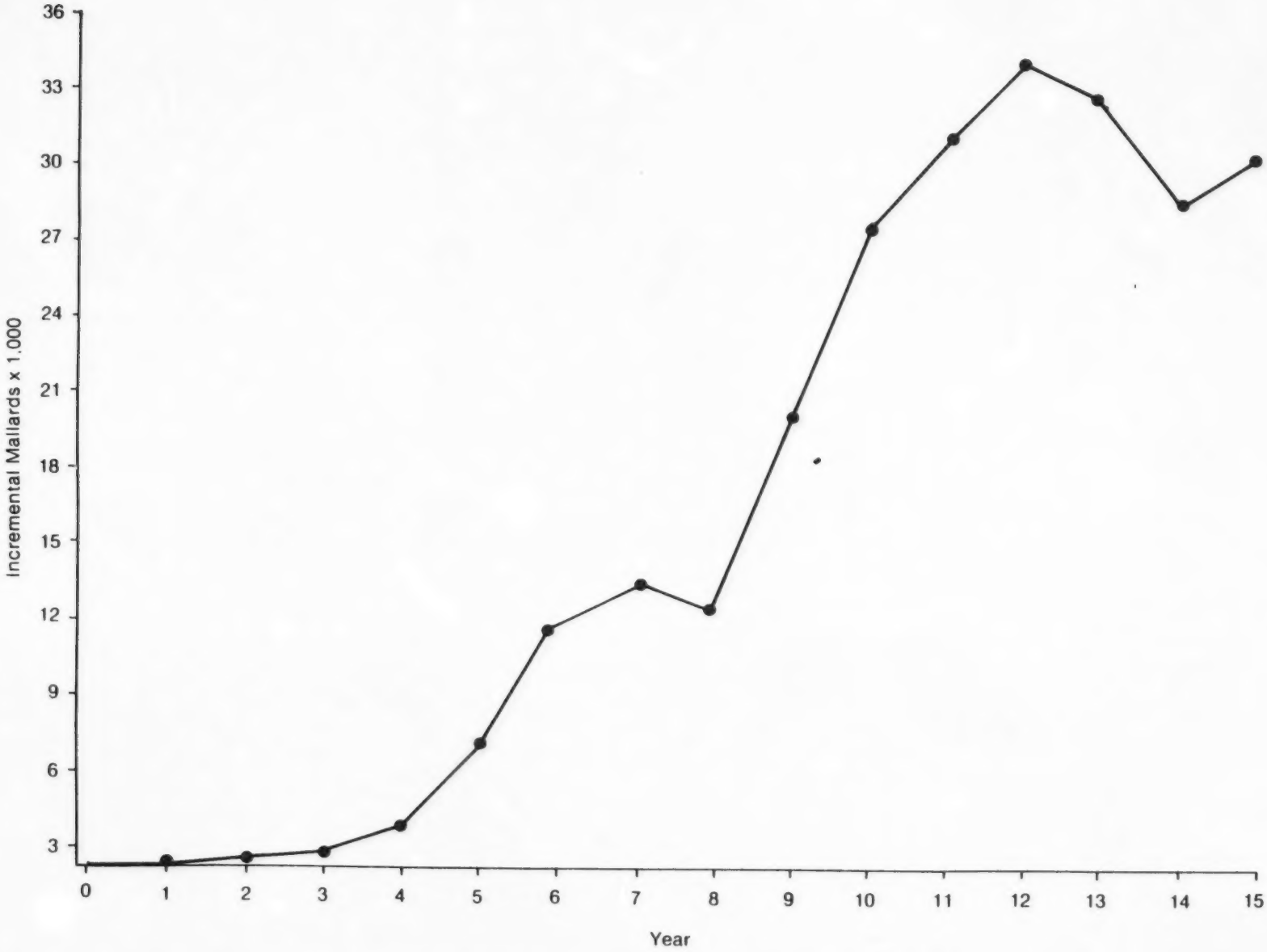

Figure 7. Incremental mallards produced over the proposed 15-year plan of the NAWMP in southern Manitoba.

0.63 for the target zones (Table 3). In any case, policy changes that promote good soil and water conservation practices may provide sufficient improved upland nesting cover in the non-targeted zones to make up the remaining shortfall in recruits and fall flights. Progress toward attaining recruitment and fall flight goals will be monitored through systematic program evaluations. These will allow the plan to be adjusted over time, as necessary, to meet the goals.

Table 4. Estimated results of the Manitoba Implementation Plan and their relationship to population goals defined in the North American Waterfowl Management Plan.

Parameter	Manitoba Implementation Plan Results			Total Objective[c] 000's	% Goal Attained
	Target[a] 000's	Non-target[b] 000's	Total 000's		
Recruits					
Present	55.8	128.8	184.6		
Incremental	28.3	28.5	56.8		
Total	84.1	157.3	241.4	399.9	60%
Spring Adults					
Present	109.8	244.0	353.8		
Incremental	9.2	54.0	63.2		
Total	119.0	298.0	417.5	400.0	104%
Fall Flight					
Present	143.7	327.0	470.7		
Incremental	36.0	72.3	108.3		
Total	179.7	399.3	579.0	759.9	76%

[a]Areas in Manitoba which will receive habitat improvement projects.

[b]Areas in Manitoba which will receive "overflow" mallards from target areas.

[c]As described in NAWMP prospectus (April, 1987).

9.5 Evaluation

Priorities for evaluation were set according to predicted costs (Table 5) and recruits produced (Table 1). The four programs ranking highest using these criteria were:

1) Drought Proofing (50% of dollars, 14% of recruits),
2) Fenced DNC (30% of dollars, 49% of recruits),
3) Unfenced DNC (6% of dollars, 5% of recruits),
4) Rotational Grazing (2% of dollars, 11% of recruits).

Together these programs accounted for 88% of the program costs budget and 79% of the estimated new recruits. Occupancy and nest success rates in nest baskets and compliance by farmers in response to delayed haying incentive payments are also priorities for early evaluation. See appendix 2 and the PHJV evaluation proposal for background information pertaining to the evaluation.

9.6 Implementation Costs

The program of habitat improvements, evaluation, crop damage prevention, communications and administration is estimated to cost about $134.3M (Table 7) over 15 years. Of this, 49.3% is required for habitat options, 29.8% Heritage Marshes, 12.7% administration, 3.2% communications, 2.8% evaluation and 2.2% Waterfowl Damage Prevention (Table 7).

The simulated direct waterfowl options accounted for 20% of total expenditures, and of this, 70% was required for development (Table 8). Within the land use modification programs, incentive payments required the majority of funds at $37.0M (Table 5), and development accounted for 45% of extensive program costs (Table 8). During the first five years, $15.0M was needed to implement options. Costs peaked during the middle five years and accounted for $32.0M or 48% of total program option funds. Evaluation costs averaged just over $400,000 during each of the first ten years.

Over the 15-year program, about 65 staff-years would be spent developing habitat, while management would require another 125 staff-years (Table 6). Extensive programs would require about 35% of the development and 10% of the total management staff-time, while intensive habitat management programs would comprise 65% and 90% of that budgeted for development and management time, respectively. Administration would require a maximum of 210 staff-years and evaluation another 82 (Table 7), bringing subtotal requirements to 482 staff-years over 15 years for Manitoba. No staff-years were assigned to the indirect, damage control, Heritage Marshes and communications programs.

Staffing requirements were estimated for each year of the plan and totaled every five years for both intensive and extensive habitat programs (Table 9). For extensive programs, about 81% of

staff-time would be committed to development during the first five-year period, while almost 64% would be allocated to management of those areas during the last five years (Table 9). By comparison, intensive programs would require about 76% of the committed staff-time to development in the first five years as opposed to only 2% in the last ten years (Table 9). However, direct programs would require much more staff-time over the 15-year plan than would land use modification options.

Table 5. Summary of estimated costs, staffing, and resources associated with various habitat programs under the proposed Manitoba Implementation Plan.

Management Plan	Cost $000,000	% Total
Land Use Modification Options		
Agriculture Extension		
Rotational Grazing[a]	1.2	2
Chemical Fallow/Stubble Mulch	1.0	1
Winter Wheat/Minimum Till	0.5	1
Subtotal	2.7	4
Incentive Payments		
Drought Proofing[b]	33.4	50
Delayed Haying	3.2	5
Subtotal	36.6	55
Direct Waterfowl Options		
DNC Fenced[c]	19.7	30
DNC Unfenced[d]	3.8	6
Inter-Pothole Seeding[e]	1.4	2
Nesting Baskets	2.0	3
Subtotal	26.9	41
Total	66.2	100

[a]Requires 5 tons tame forage seed.

[b]Requires 5,000 tons of mixed hay seed.

[c]Requires 81 tons of native cool-season grass seed.

[d]Requires 1 ton of native cool-season grass seed; 19.2 tons of introduced cool-season grass seed.

[e]Requires 29 tons of introduced cool-season grass seed.

Table 6. Summary of estimated staffing requirements associated with various habitat programs under the proposed Manitoba Implementation Plan.

Management Plan	Staff-Years					
	Development		Management		Total	
	#	%	#	%	#	%
Land Use Modification Options						
Agriculture Extension						
Rotational Grazing	8.0	12	4.0	3	12.0	6
Chem. Fallow/Stubble Mulch	2.1	3	0.3	0	2.4	1
Winter Wheat/Minimum Till	1.5	2	0.0	0	1.5	1
Subtotal	11.6	17	4.3	3	15.9	8
Incentive Payments						
Drought Proofing	6.4	10	8.4	7	14.8	8
Delayed Haying	5.1	8	0.0	0	5.1	3
Subtotal	11.5	18	8.4	7	19.9	11
Direct Wildlife Options						
DNC Fenced	14.8	23	94.2	76	108.9	58
DNC Unfenced	7.5	12	4.0	3	11.5	6
Inter Pothole Seeding	5.9	9	0.0	0	5.9	3
Nesting Baskets	13.6	21	13.6	11	27.3	14
Subtotal	41.8	65	118.8	90	153.6	81
TOTAL	64.9	100	131.5	100	189.4	100

Table 7. Summary of Manitoba Implementation Plan costs over 15 years.

Program Options	Cost 000,000	%
Direct Wildlife Options		
DNC Fenced	19.7	14.7
DNC Unfenced	3.8	2.8
Inter-pothole seeding	1.4	1.0
Nesting baskets	2.0	1.5
Subtotal	26.9	20.0
Land Use Modification Options		
Rotational Grazing	1.2	0.9
Chemical Fallow/Stubble Mulch	1.0	0.7
Winter Wheat/Minimum Till	0.5	0.4
Drought proofing	33.4	24.9
Delayed haying	3.2	2.4
Subtotal	39.3	29.3
Heritage Marsh Program	40.0	29.8
Administration	17.1	12.7
Evaluation	3.8	2.8
Waterfowl Damage Prevention	3.0	2.2
Communications	4.2	3.2
Subtotal	68.1	50.7
TOTAL	134.3	100.0

Table 8. Total costs overtime required to carry out the Manitoba Implementation Plan and divided between habitat development and management.

Program	Years	Costs 000's	% Development	% Mgmt	% Total
Direct Wildlife Options	1-5	5,911.6	94.6	5.4	100
	6-10	14,211.6	82.5	17.5	100
	11-15	6,843.8	21.5	78.5	100
		26,967.0	69.6	30.4	100
Land Use Modification Options	1-5	9,264.2	84.6	15.4	100
	6-10	17,703.1	43.9	56.1	100
	11-15	12,143.8	14.6	85.4	100
		39,111.1	44.5	55.5	100
OVERALL TOTAL		66,078.1	54.7	45.3	100

Table 9. Total staff years over time required to carry out the Manitoba Implementation Plan and divided between habitat development and management.

Program	Year	Staff Years					
		Development		Management		Total	
		#	%	#	%	#	%
Direct Wildlife Options	1-5	18.5	76.4	5.7	23.6	24.2	100
	6-10	22.5	38.7	37.7	61.3	60.2	100
	11-15	1.4	2.0	68.2	98.0	69.6	100
	Subtotal	42.4	27.9	111.6	72.1	154.0	100
Land Use Modification	1-5	8.9	80.9	2.1	19.1	11.0	100
	6-10	12.0	64.2	6.7	35.8	18.7	100
	11-15	2.3	36.5	4.0	63.5	6.3	100
	Subtotal	23.2	64.4	12.8	35.6	36.0	100
OVERALL TOTAL		65.6	34.5	124.4	65.5	190.0	100

10.1 General Organization

The majority of field and extension activities will occur in southwestern Manitoba. Therefore the administrative headquarters for this program also should be located within the area. District offices should be located in towns where there are already agricultural (MDA)representatives. Office space and computer facilities will be required for management, planning, and scheduling.

Eventually, there could be up to five district offices, each servicing approximately 30 target townships. Costs and habitat development plans were based on this concept to reduce logistical constraints.

Each office would require managerial and support staff. One permanent extension specialist and a habitat biologist would be required in each office with managers in the central office. Each district specialist would perform the duties of coordinating and designing projects and planning summer activities. During the summer, these people would continue to coordinate activities while spending most of their time in the field developing and managing projects.

Managers would provide formal training to their district staff, design programs and monitor success by coordinating with those conducting evaluations.

The following sections highlight some of the resources and constraints associated with implementation. Suggestions to alleviate perceived problems also are discussed (see Appendix 3).

10.2 Direct Wildlife Options

Implementation of the Direct Wildlife Options will place demands on equipment and staff resources far in excess of what now exists among the various agencies. Therefore, a well-coordinated program of staff training and equipment assembly is required during the initial stages of implementation.

10.2.1 Manpower

Early emphasis will be placed on locating sites within target townships suitable for the establishment of DNC plots. To reduce the time associated with negotiations for projects, Manitoba Department Agriculture (MDA) representatives, wildlife agencies, and Conservation District managers would be canvassed for site recommendations.

Presently, there is a lack of trained habitat managers. Individuals expected to fill this role will require expertise in all phases of grassland establishment and management. In order to overcome this staff shortfall, a training program must be established in the first year of the program. Ideally, some staff time from MDA and wildlife agencies also should be made available to assist in training personnel. Training sites should be located in the districts to allow new staff to gain familiarity with the environmental variability of the area.

10.2.2 Equipment and Supplies

Spraying equipment, good quality seed drills, and an array of fire fighting equipment will be required in each district office. Grassland management relies heavily on prescribed burns and weed control. If robust stands of planted DNC are to be maintained, roughly 20-30 burns per district would be undertaken annually once the plan is fully implemented.

Presently, the single greatest constraint facing implementation is the shortage of desirable varieties of both introduced and native grass seed. Seed requirements of the NAWMP are considerable (see Table 6), and as such, developing Manitoba sources should be a high priority. For example, local growers should be encouraged by supplying seed and expertise, thus eliminating their initial risks. The program could recover start-up costs from the grower in the form of low-priced seed over a period of two or three years.

Another constraint is securing an adequate supply of nest structures. The program requires 3900, and at present no outlet can supply such large quantities. A contractor should be located in the early stages of the program that is capable of mass production of low maintenance structures.

10.3 Land Use Modification Options

10.3.1 Manpower

The agricultural extension program would rely heavily on cooperation with MDA. MDA representatives and Conservation District managers would provide contacts with potential farm cooperators, advice about farming practices, and assist with tours and meetings.

NAWMP extension activities should be coordinated with those of PFRA and MDA. Conservation farmer groups, DNR personnel, rural political leaders, and supportive individual landowners could take leading roles to introduce

and maintain the local popularity of the NAWMP.

A major constraint in the early stages of the program will be a lack of personnel trained in the combined fields of habitat management, agrology, and extension services. Thus, initially, wildlife agencies must rely largely on cooperating with MDA extension programs. An atmosphere of inter-agency trust must be developed to promote cooperation in program delivery. Training courses should be given to permanent staff, casual assistants, and contractors.

10.3.2 Equipment and Supplies

It is essential to develop contacts with suppliers of special implements, chemicals, forage seeds, and contract seeding services to ensure that these resources will be available in a timely manner. Good planning during the first three years is critical in order to obtain agreements from dealers and contractors to meet the needs of the NAWMP.

Forage seed could be in short supply during the early stages, due to other land retirement programs in North America. Local seed suppliers will be required and encouraged to develop a dependable supply of high quality forage and hay seed. Herbicide manufacturers, often willing to supply chemicals at preferred rates, in return for the benefits of publicity and education, will be asked to cooperate in various programs.

Herbicide use can be contentious in some areas, both from the user's and the biologist's points of view. Lately, there has been a sense that conservation farming may increase the use of pesticides with the attendant dangers. Although this attitude may have resulted in part through misinformation or lack of information, close monitoring of application techniques, and short-and long-term effects of herbicides on the environment is a vital requirement and must be addressed in the PHJV evaluation proposal.

10.4 Evaluation

10.4.1 Manpower

Requirements for trained evaluation staff are probably in excess of what is currently available. Field staff must be competent in waterfowl identification and the techniques used in nesting studies. If evaluations are conducted concurrently with others scheduled across the prairies, arrangements may be needed with Canadian Immigra

tion to allow hiring of some seasonal staff from the USA. Even at that, the Small Unit Management Project of the USFWS will compete strongly for qualified help. Training programs will be essential and should be coordinated by the Evaluation Group to ensure compatible results from studies across the prairie provinces.

A full time provincial coordinator will be required to administer evaluations planned for Manitoba. Located in the central office, this person would provide a direct link between the field evaluations and the central evaluation group. Data would be routed through the coordinator to the evaluation organization for analysis and reporting.

10.4.2 Equipment and Supplies

Plans for evaluating nesting success call for large initial investments in equipment. The option of purchase vs. lease needs to be considered when costs are amortized over the ten-year span of evaluations. The purchase of all equipment and its assumed depreciation, with some replacement, has been budgeted over ten years (see PHJV evaluation proposal for details).

All costs for the purchase and development of land central to each study site will be covered under the habitat development programs. This way study sites will contribute toward the acreage and waterfowl goals. However, further development within the study sites and control areas, as part of implementation, would have to be agreed to by the province and evaluation organization. Maintenance of habitat developments within study sites would be part of the ongoing provincial habitat management costs.

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Appendix 1. Assumptions followed in use of the Mallard Production Model.

The Mallard Production Model was not developed as a year-round simulator. Research needed to allow this important refinement has been initiated by the USFWS (D. Johnson pers. comm.). Until such refinements are available, several assumptions were required in order to test the long-term progressive effects of a habitat enhancement program on mallard recruitment in Manitoba.

1. The model operates by settling a population of breeding mallards on a given landscape. For our simulations, year zero was assumed to be 1986 and mallard breeding pair densities observed on CWS survey segments in target townships that year were used.

2. The number of waterfowl breeding in southern Manitoba depends to a significant extent on the number of May ponds here and in other parts of the breeding range. In order to simulate wetland conditions after 1986, CWS May pond and pair data between 1971 and 1985 for Manitoba were used. We divided this 15-year sample equally into dry, wet, and average categories. Years were chosen proportionally and at random from each category, and assigned in random order to simulation years one to ten (1987-96). Therefore, through this ten-year period, three years were assigned from the "wet," three from the "dry," and four from the "average" category, with random ordering of these events. Departures from these conditions could strongly affect pair populations and hence the results of the implementation program.

3. We assumed that for a given wetland density, improvements to the quality of upland cover will not increase mallard breeding densities (pairs/pond) in the target area to levels above those recorded since 1971. When "carrying capacities" are exceeded, birds will move to adjacent areas and some will breed successfully. Movements will cease when populations fall to, or below, carrying capacity. This threshold level needs to be determined more precisely.

4. In order to estimate carrying capacities for treatment areas, we plotted 1971-86 CWS pair and pond data for those areas. The three to four highest plotted data points were used to develop a carrying-capacity regression line. For years when carrying capacity was exceeded in target areas, we assumed the extra birds would breed elsewhere. For years with pair densities below the carrying-capacity line, we assumed that there would be room for additional breeders to settle within the treatment areas. Therefore, by annually comparing actual pond data (assigned at random to each of years 1987-96) with the theoretical level of carrying capacity, we estimated the space available in our target area for additional pairs as a result of habitat improvement programs.

5. The only factor affecting nest success is assumed to be cover type. No provision was made to adjust success rates relative to predator populations.

Appendix 1. Continued.

6. When simulating habitat changes on large areas (e.g., strata), difficulties arise in deciding how many pairs will actually be affected. Treatments were applied on a scale broad enough that all pairs could be assumed to have access to the habitats.

7. We assumed that various covers attract other upland nesting duck species in the same way that mallards are attracted. Recruitment was adjusted by multiplying results for mallards by a correction factor. That factor is calculated by taking the reciprocal of the proportion mallards comprise of the upland nesters in the study area. Thus, if mallards comprise 27% of the upland nesting pair population, the correction applied is 3.704. We assumed that only mallards use baskets.

8. Mallard survival rates in Manitoba were assumed to be 0.804 for adults and 0.848 for young-of-the-year from the beginning of October to initiation of the following nesting season based on CWS banding data. Survival rates for hens during the nesting season were estimated by the model and depend on study area characteristics. Areas with low nest success typically lose more hens because some hens are killed when nests are taken. Annual survival rates for hens were assumed to be 0.58. Summer survival rates were assumed to be 0.635 for females and 0.989 for males based on recent stabilized regulations studies. We also assumed that the fall age ratio in non-target zones was 0.65 immatures/adult.

9. The seasonal pattern of nesting for mallards observed in North Dakota was assumed also for Manitoba. This pattern of nesting is related temporally to land use practices. For example, we assumed the date of hay cutting, relative to the mallard hatch curve for an average year, was the same in all areas considered; i.e., if nesting begins ten days later in Manitoba than in North Dakota, we assumed haying also begins ten days later.

10. Seasonal brood survival rates were assumed constant at 74%. Seasonal duckling survival rates were also assumed to remain constant at 54%. These rates were not varied with wetland conditions because no information about this is currently available.

Appendix 2. Evaluation background.

Waterfowl population response to tracts of improved nesting cover depends on several factors. The quality and density of wetlands will determine how many breeding pairs an area can support. The number of pairs in an area and their home range size will, in turn, determine the potential nesting response in any given cover type. The relative attractiveness and abundance of "competing" cover types will affect the number of nest initiations in specific cover types.

Assumptions have been made about these processes during the development of this implementation plan. Because all of the above factors could affect waterfowl recruitment resulting from habitat enhancement programs, evaluations should be designed to monitor both pair populations and nesting success in several habitats across the parkland region over ten years.

In Manitoba's plan, we assumed that DNC would be applied at a rate of three 40 ac. plots in each targeted township. At this level of application, all breeding pairs in each township are assumed to have access to DNC. For this and logistical reasons, we recommend the establishment of 9 mi^2 study sites. Based on average search rates, this would likely allow all hayland, ROW, emergent, pasture, brushland, and odd areas within each study site to be nest-searched at least three times during the nesting period.

Evaluations will be conducted on study sites with upland habitats comparable to areas where the particular program will be applied. Study sites will have one form of treated cover developed close to the center. DNC evaluations will be set up in study site clusters of a Control, a Fenced site, and an Unfenced site. Rotational Grazing sites will each be paired with a Control. All sites within each cluster or pairing will be selected to have comparable wetland bases.

Two DNC evaluations in clusters of three study sites, and one Rotational Grazing evaluation comprised of a treated site paired with a Control will be located in Manitoba. In total, eight sites comprising 72 mi^2 will be evaluated by a seasonal staff of 24 people. The cost for staff and equipment over ten years will total approximately $3.8M.

To ensure the integrity of long-term studies, we recommend financial compensation for operators owning land central to the treatment being evaluated. Habitats on all other sections will be searched, whenever possible, on a free-easement basis, relying on cooperation with individual landowners.

Nest data will be used to determine relative attractiveness and success of the various habitats used by waterfowl. Pair counts and predator presence/absence data will be collected and habitat base maps will be digitized to aid in comparisons of CPT predictions with observed trends. We expect pair populations to build on the treated study site as a result of increased nest success relative to the control site. Each study site should be monitored over

the long term to determine if assumed carrying capacities are realistic; i.e., some density-dependent effect should be observed on the treated areas as pair populations build. To ensure that predator communities are comparable and pair populations distinct, control areas should be about, but no closer than, four miles from the treated study site.

Appendix 3. Manitoba direct program requirements over first four years of the NAWMP.

Year 0

Intensive	Extensive
- *hire central office permanent staff and establish office; develop training programs	- hire central office permanent staff and establish office
- *acquire seed and help develop local sources	- initial contacts with MDA staff in southwest Manitoba
- *locate initial DNC sites in relation to evaluation criteria and undertake preplant preparations	- develop PR program needs with managers in other provinces
- *procure suitable seed drills	- contact agency to produce PR materials and media arrangements
- locate source for mass production of nest structures	- locate sites for initial demonstration projects
- locate materials--fencing, etc.	

Year 1

Intensive	Extensive
- *hire permanent district staff and establish offices; intensive training program	- hire permanent district staff and establish offices; intensive training program
- begin seeding initial DNC sites; erect fences	- *local public education program; "sell the program"
- locate sites and undertake pre plant preparations for year 2	- procure equipment (drills, etc.)
- *work closely with seed producers	- establish initial demos
- *hire technicians and begin training program	- hire technicians and begin training program

*crucial items

Appendix 3. Continued

Year 2

Intensive	Extensive
- *locate contractors for DNC establishment and predator fence maintenance	- purchase one-half remaining key equpment
- *work closely with seed producers	- hire local part time assistance as required
- establish DNC plantings	
- maintain DNC established in year 1	
- *hire project maintenance foreman (spring)	
- locate sites and undertake pre plant preparations for year 3	

Year 3

Intensive	Extensive
- *locate contractors for DNC establishment and maintenance	- purchase remaining equipment
- *locate contractors for predator fence maintenance (high man-day requirements)	
- establish DNC plantings	
- *work closely with seed producers	
- *establish seed production at a northern site	
- locate sites and undertake pre plant preparations for year 4	

*crucial items